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GB 0756153 GB 0414437 US 3828437
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(58) Field of search
G1M
G1K

(54) Measuring speed and/or length of elongate material

(57) The speed and/or length of an elongate material 4 is measured from the corresponding speed and/or movement of one of a pair of belts 2 and 6 between the facing runs of which the material 4 passes. The belts are driven by friction with the elongate material, and errors due to slippage are kept to a minimum due to the extended contact of the belts with the material over the length of the runs. When the belts are supported by pulleys 3 and 5, the speed and/or length of the material is measured by an encoder 7 responsive to the rotation of the pulley 3.

The runs of the belts are preferably horizontal and when used in conjunction with the manufacture of the elongate material, are preferably aligned with the exit of the material from the manufacturing apparatus.

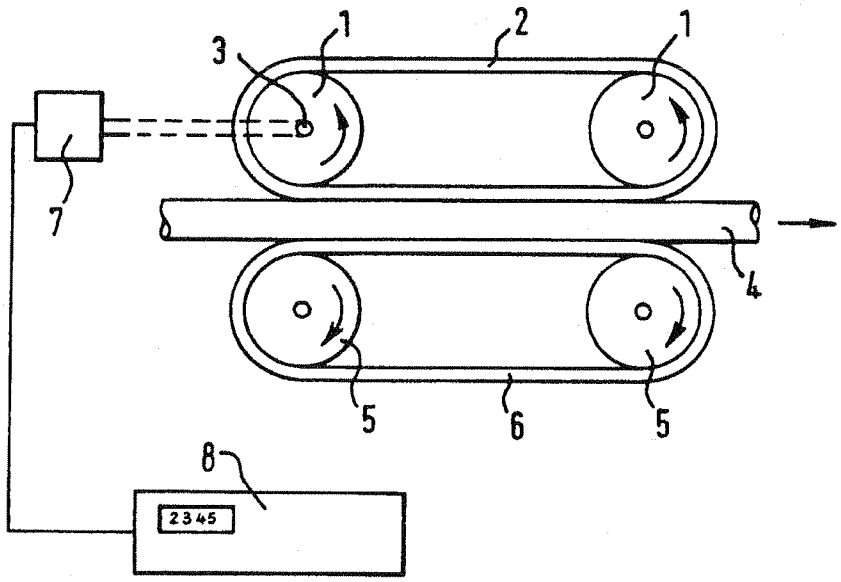

FIG.1.

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The drawings originally filed were informal and the print here reproduced is taken from a later filed formal copy.

The claims were filed later than the filing date within the period prescribed by Rule 25(1) of the Patents Rules 1982.

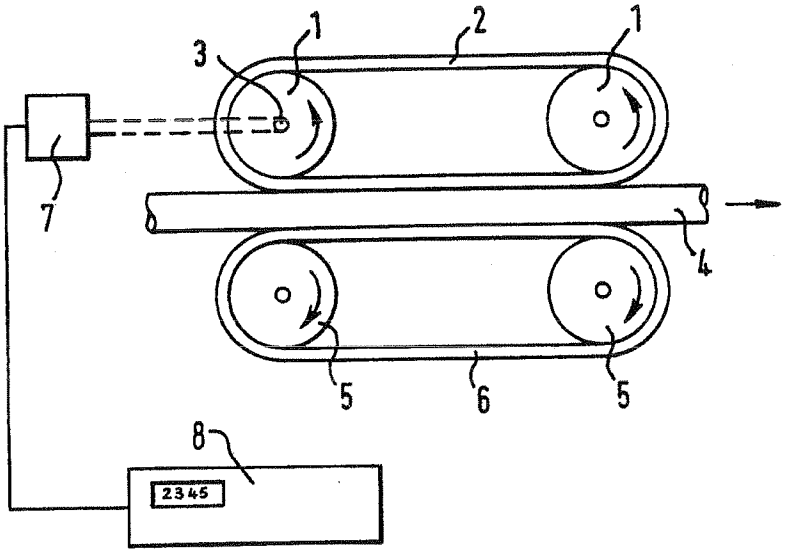

FIG.1.

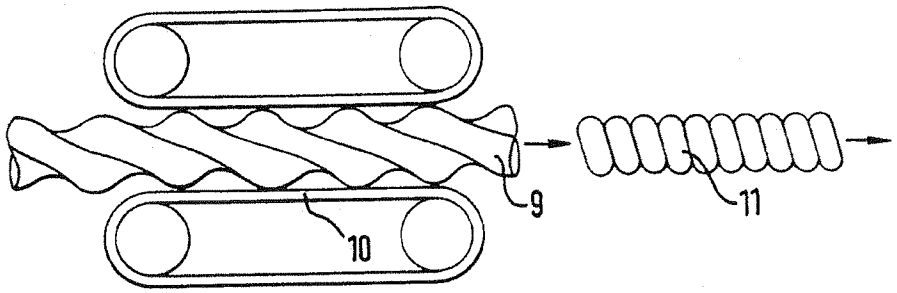

FIG.2.

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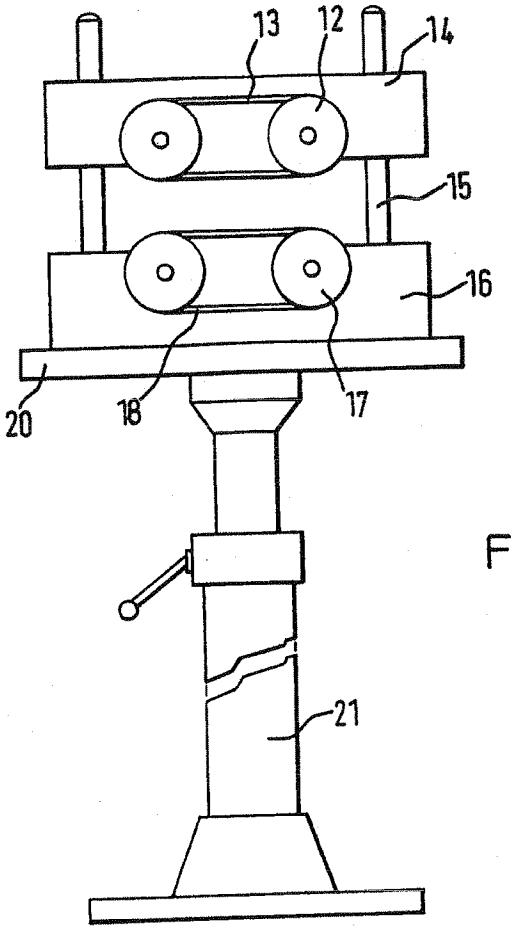

FIG.3.

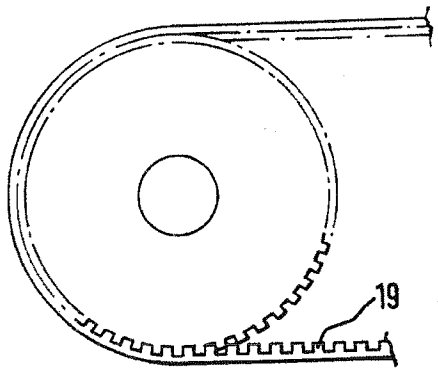

FIG.4.

SPECIFICATION

Measuring speed and/or length of elongate material

The present invention relates to measuring speed and/or length of elongate material, such as tubes, cables and strips. In particular, but not exclusively, the invention is applicable to the measurement of speed and/or length of elongate material during its manufacture or its treatment by, for example, extrusion, pressing or drawing.

It is known to measure the length of elongate material by using apparatus comprising a wheel of known diameter provided with a mechanical counter. Elongate material rests on and makes tangential contact with the wheel, for example, as the material is produced. As the material advances, it causes the wheel to rotate and the mechanical counter indicates the number of rotations of the wheel and hence the length of the material produced.

Although this known apparatus is inexpensive to produce, its use has the disadvantage that the elongate material is subject to frictional slip on the wheel, thereby resulting in measurement errors. To reduce slip a further wheel may be provided so that there are two wheels, one above and one below the material. However, a certain amount of slip may still occur.

It is also known to wrap the elongate material in a single turn around a single wheel provided with a counter as described above. However, the material must be flexible enough to be wrapped around the wheel. The slip problem is largely overcome by this technique and the length of the material can be accurately measured provided that the apparatus has been calibrated for that type and thickness of material. Since the type and thickness of the material affects the amount of rotation of the wheel per unit length of material, the apparatus requires recalibration for each type and thickness of material to be measured.

The invention aims to overcome the aforementioned disadvantages.

In one aspect of the present invention there is provided a method of measuring the speed and/or length of elongate material, comprising passing the material between and in contact with runs of two endless belts, which runs are driven at the same speed and in the same direction as the material, and producing an output signal proportional to the speed and/or extent of movement of at least one of the belts.

The belts should preferably be in tight contact with the material so as to pevent slippage between the belts and the material.

In another aspect of the invention, there is provided apparatus for measuring the speed and/or length of elongate material comprising two endless belts having adjacent facing runs between which the material, the speed and/or length of which is to be measured, can pass in contact therewith and means for producing an output signal proportional to the speed and/or extent of movement of at least one of the belts.

The speed and/or length of the material may be measured while it is being produced or processed.

The belts may be made of flexible plastic, rubber or leather.

The belts preferably pass around pulleys or rollers.

Preferably at least one of the belts has internal teeth and passes around at least one toothed pulley or roller, the teeth of the belt engaging the teeth of the pulley or roller so that slippage between the belt and the pulley or roller is prevented and the output signal can be accurately derived from the speed of rotation of the pulley or roller and/or the amount of rotation of the pulley or roller.

Preferably the elongate material passes horizontally between the runs of the belts.

The elongate material may travel in a straight line from its position of manufacture and between the runs of the belts.

The elongate material may be electrical cable, rope or wire.

Preferably an output signal derived from rotation of a pulley around which the belt passes is translated via an encoder into a readout an output of speed and length.

It is to be understood that the elongate material advances in its lengthwise direction between the runs of the belts and the runs of the belts are arranged with their lengthwise directions parallel to that of the elongate material.

The invention is further described below by way of example with reference to the accompanying drawings, wherein:

Figures 1 and 3 show diagrammatically apparatus according to the invention; and

Figures 3 and 4 show diagrammatically parts of such apparatus.

Referring to Fig. 1, the apparatus shown therein comprises two pulleys 1 around which pass a flexible endless belt 2. The pulleys 1 and 2 are are free to rotate together with the belt 2 and can also be raised and lowered together with the belt 2.

The apparatus further comprises a pair of pulleys 5 similar to the pulleys 1 and 2 and around which an endless belt 6 similar to the belt 2 passes. The pulleys 5 are also free to rotate in either direction together with the belt 6.

An encoder 7 or other similar signal outputting device is connected to the pulley 1 and is connected to an indicator unit 8.

In use material 4 which is to be measured is rested on the belt 6 and the belt 2 is

lowered onto the material 4. Thus the upper run of the belt 6 and the lower run of the belt 2 make contact with the material 4, these runs and the material 4 being mutually parallel.

As the material 4 advances in its lengthwise direction, the belts 2 and 6 travel around the pulleys 1 and 5, the pulleys rotating and the left (as viewed in Fig. 1) pulley 1 causing the encoder 7 to send a signal to the indicator unit 8 which analyses the signal and processes it through electronic circuitry which then displays the speed of the material and the length of the material produced.

It will be appreciated that because the pulleys 1 are spaced from each other along the length of the material 4 and the pulleys 5 are similarly spaced, a substantial length of each belt 2 and 6 makes contact with the material 4 and thus no slippage occurs between the belts 2 and 6 and the material 4.

It will further be appreciated that the length of the material 4 can be measured without recalibration irrespective of its thickness.

Furthermore, as shown in Fig. 2, the apparatus can be used in measurement of elongate materials 9 having irregular surfaces because the belts effect envelope contact with the material i.e. the belts make contact with the highest spots of these materials, a feature which is impossible to achieve by previously known means,

The material to be measured may be corrugated material 11, irregularly shaped cables (electrical or mechanical) stranded materials or wavy materials.

As shown in Fig. 3, the apparatus may comprise a pair of timing pulleys 12 and a timing belt 13. The two pulleys 12 are mounted on a block 14 which can be raised and lowered on vertical rods 15. The rods 15 are fitted into a second block 16 which carries a second pair of pulleys 17 around which passes a timing belt 18.

The timing belt may be a toothed belt as shown in Fig. 4, the teeth 19 of which engage with teeth on the corresponding pulley 12 or 17.

Alternatively an ordinary flat belt and flat pulleys can be used although it has been found in practice that the best results have been obtained by using toothed belts and pulleys.

The pulleys are preferably made from a light alloy metal and the belts are preferably made from durable high-density plastic or rubberised material to provide long life characteristics.

The block 16 may be mounted on a platform 20 carried by a height-adjusting stand 21 so that the pulleys and belts can be placed in line with the advancing elongate material to be measured.

CLAIMS

1. Apparatus for measuring the speed and/or length of elongate material comprising two endless belts having adjacent facing runs between which the material, the speed and/or length of which is to be measured, can pass in contact therewith, and means for producing an output signal proportional to the speed and/or extent of movement of at least one of the belts.

2. Apparatus as claimed in claim 1 comprising a roller around which said one belt passes, said producing means producing an output signal dependent on the rotation of said roller.

3. Apparatus as claimed in claim 2 wherein said roller is toothed and said one belt has internal teeth co-operating with the teeth of the roller.

4. Apparatus as claimed in any one of claims 1 to 3 wherein said adjacent facing runs are horizontal.

5. Apparatus as claimed in any one of claims 1 to 4 wherein said belts are of flexible plastics material.

6. Apparatus for measuring the speed and/or length of elongate material substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

7. Apparatus as claimed in any one of the preceding claims in combination with apparatus for manufacturing said elongate material, said adjacent facing runs being arranged relative to the manufacturing apparatus so that the elongate material travels in a straight line from its position of manufacture and between the runs of the belts.

8. A method of measuring the speed and/or length of elongate material comprising passing the material between and in contact with runs of two endless belts which are caused by friction forces to move at the same speed and in the same direction as the material, and producing an output signal proportional to the speed and/or extent of movement of at least one of the belts.

9. A method as claimed in claim 8 wherein said runs are horizontal.

10. A method of measuring the speed and/or length of elongate material substantially as hereinbefore described with reference to the accompanying drawings.

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